DOCUMENT RESUME

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TITLE	Construction Mechanic, Engine Tune-Up I, 8-7. Military Curriculum Materials for Vocational and Technical Education.
INSTITUTION	Naval Construction Training Center, Port Hueneme, Calif.; Ohio State Univ., Columbus. National Center for Research in Vocational Education.
SPONS AGENCY	Office of Education (DHEW), Washington, D.C.
PUB DATE	78
NOTE	140p.; For related documents, see CE 034 542-545.
PUB TYPE	Guides - Classroom Use - Materials (For Learner) (051) -- Guides - Classroom Use - Guides (For Teachers) (052)
EDRS PRICE	MF01/PC06 Plus Postage.
DESCRIPTORS	Audiovisual Aids; *Auto Mechanics; Course Content; Educational Resources; Electrical Systems; *Engines; Learning Activities; Lesson Plans; *Mechanics (Process); *Motor Vehicles; Postsecondary Education; Power Technology; Secondary Education; Technical Education; *Units of Study; Vocational Education
IDENTIFIERS	*Automotive Tune Up; Military Curriculum Project

ABSTRACT

This course, adapted from military curriculum materials for use in vocational and technical education, teaches students to perform a complete engine tune-up using appropriate hand tools, special tools, and testing equipment. Students completing the course will be able to diagnose gasoline-engine performance and perform corrective measures to restore the engine to the level specified by the manufacturer. The course is divided into two units totaling 81 hours of classroom and shop instruction. Unit 1 on introduction and safety precautions contains a 1-hour lesson introducing the course and discussing safety procedures. Unit 2 on gasoline engine tune-up (advanced) contains three lessons covering 80 hours of classroom and shop instruction on fuel systems components, ignition systems components, and crankcase ventilation service and final tune-up. The course contains both teacher and student materials in one document. Instructor materials include an introduction to the course; an outline of instruction; lists of texts, references, training aids, equipment, course materials, and materials to be prepared by the instructor; and a master schedule. Student materials include one job sheet and two information sheets. (KC)

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

MILITARY CURRICULUM MATERIALS

The military-developed curriculum materials in this course package were selected by the National Center for Research in Vocational Education Military Curriculum Project for dissemination to the six regional Curriculum Coordination Centers and other instructional materials agencies. The purpose of disseminating these courses was to make curriculum materials developed by the military more accessible to vocational educators in the civilian setting.

The course materials were acquired, evaluated by project staff and practitioners in the field, and prepared for dissemination. Materials which were specific to the military were deleted, copyrighted materials were either omitted or approval for their use was obtained. These course packages contain curriculum resource materials which can be adapted to support vocational instruction and curriculum development.

The National Center Mission Statement

The National Center for Research in Vocational Education's mission is to increase the ability of diverse agencies, institutions, and organizations to solve educational problems relating to individual career planning, preparation, and progression. The National Center fulfills its mission by:

- Generating knowledge through research
- Developing educational programs and products
- Evaluating individual program needs and outcomes
- Installing educational programs and products
- Operating information systems and services
- Conducting leadership development and training programs

FOR FURTHER INFORMATION ABOUT
Military Curriculum Materials
WRITE OR CALL

Program Information Office
The National Center for Research in Vocational Education
The Ohio State University
1960 Kenny Road, Columbus, Ohio 43210
Telephone: 614/486-3655 or Toll Free 800/848-4815 within the continental U.S. (except Ohio)

THE NATIONAL CENTER FOR RESEARCH IN VOCATIONAL EDUCATION

Military Curriculum Materials for Vocational and Technical Education

Information and Field Services Division

The National Center for Research in Vocational Education

Military Curriculum Materials Dissemination Is . . .

an activity to increase the accessibility of military developed curriculum materials to vocational and technical educators.

This project, funded by the U.S. Office of Education, includes the identification and acquisition of curriculum materials in print form from the Coast Guard, Air Force, Army, Marine Corps and Navy.

Access to military curriculum materials is provided through a "Joint Memorandum of Understanding" between the U.S. Office of Education and the Department of Defense.

The acquired materials are reviewed by staff and subject matter specialists, and courses deemed applicable to vocational and technical education are selected for dissemination.

The National Center for Research in Vocational Education is the U.S. Office of Education's designated representative to acquire the materials and conduct the project activities.

Project Staff:

Wesley E. Budke, Ph.D., Director
National Center Clearinghouse

Shirley A. Chase, Ph.D.
Project Director

What Materials Are Available?

One hundred twenty courses on microfiche (thirteen in paper form) and descriptions of each have been provided to the vocational Curriculum Coordination Centers and other instructional materials agencies for dissemination.

Course materials include programmed instruction, curriculum outlines, instructor guides, student workbooks and technical manuals.

The 120 courses represent the following sixteen vocational subject areas:

- Agriculture
- Aviation
- Building & Construction Trades
- Clerical Occupations
- Communications
- Drafting
- Electronics
- Engine Mechanics
- Food Service
- Health
- Heating & Air Conditioning
- Machine Shop
- Management & Supervision
- Meteorology & Navigation
- Photography
- Public Service

The number of courses and the subject areas represented will expand as additional materials with application to vocational and technical education are identified and selected for dissemination.

How Can These Materials Be Obtained?

Contact the Curriculum Coordination Center in your region for information on obtaining materials (e.g., availability and cost). They will respond to your request directly or refer you to an instructional materials agency closer to you.

CURRICULUM COORDINATION CENTERS

EAST CENTRAL
Rebecca S. Douglass
Director
100 North First Street
Springfield, IL 62777
217/782-0759

MIDWEST
Robert Patton
Director
1515 West Sixth Ave.
Stillwater, OK 74704
405/377-2000

NORTHEAST
Joseph F. Kelly, Ph.D.
Director
225 West State Street
Trenton, NJ 08625
609/292-6562

NORTHWEST
William Daniels
Director
Building 17
Airdustrial Park
Olympia, WA 98504
206/753-0879

SOUTHEAST
James F. Shill, Ph.D.
Director
Mississippi State University
Drawer DX
Mississippi State, MS 39762
601/325-2510

WESTERN
Lawrence F. H. Zane, Ph.D.
Director
1776 University Ave.
Honolulu, HI 96822
808/948-7834

CONSTRUCTION MECHANIC, ENGINE TUNE-UP I

Classroom Course

Developed by:

United States Navy

Development and Review Dates

October 9, 1974

D.O.T. No.:

620-281

Occupational Area:

Engine Mechanics

Target Audiences:

Grades 11-adult

Print Pages:

84

Cost:

Availability:

Military Curriculum Project, The Center for Vocational Education, 1960 Kenny Rd., Columbus, OH 43210

Contents:	Type of Materials: Lesson Plans:	Programmed Text:	Student Workbook:	Handouts:	Text Materials:	Audio-Visuals:	Instructional Design: Performance Objectives:	Tests:	Review Exercises:	Additional Materials Required:	Type of Instruction: Group Instruction:	Individualized:
Unit 1.1 – Introduction and Safety Precautions												
1.1.1 – Introduction and Safety Precautions	•			•			•	★			•	
Unit 1.2 – Gasoline Engine Tune-Up (Advanced)												
1.2.1 – Test, Diagnose, and Repair Fuel System Components	•			•	★	★	•	★		★	•	•
1.2.2 – Test, Diagnose, Repair and Adjust Ignition System Components	•				★	★	•	★		★	•	•
1.2.3 – Positive Crankcase Ventilation Service and Final Tune-Up	•				★		•	★		★	•	•

★ Materials are recommended but not provided.

Course Description

Students completing this short course will be able to perform a complete engine tune-up using appropriate hand tools, special tools, and testing equipment. Specifically they will diagnose gasoline engine performance and perform corrective measures to restore the engine to the level specified by the manufacturer.

The course is divided into two units totaling 81 hours of classroom and shop instruction. Unit 1.1—**Introduction and Safety Precautions** contains one hour lesson introducing the course and discussing safety procedures. Unit 1.2—**Gasoline Engine Tune-Up (Advanced)** contains three lessons covering 80 hours of classroom and shop instruction. The lesson titles and hours are listed below:

1.2.1 Test, Diagnose, and Repair Fuel Systems Components (6 hours classroom, 14 hours shop)
1.2.2 Test, Diagnose, Repair, and Adjust Ignition System Components (7 hours classroom, 14 hours shop)
1.2.3 Positive Crankcase Ventilation Service and Final Tune-Up (4 hours classroom, 10 hours shop)

This course consists of one document containing both teacher and student materials. Instructor materials include an introduction to the course; outline of instruction; lists of texts, references, training aids, equipment, materials, and materials to be prepared by the instructor; and a master schedule. Student materials include one job sheet and two information sheets.

The texts for this course are not provided. Three commercially produced manuals and one military manual are recommended. Six transparencies, a training chart, and the following films are also recommended, but are not included in this package:

MA-8886 Carburetor Principles of Operation (25 min.)
MA-8701D Automotive Electricity for Military Vehicles, Part IX, Ignition Circuit (11 min.)

THE CENTER FOR VOCATIONAL EDUCATION
THE OHIO STATE UNIVERSITY

CONSTRUCTION MECHANIC, ENGINE TUNE-UP 1

Table of Contents

Course Description	Page 1
Curriculum Outline	
Topic 1.1.1 - Introduction and Safety Precautions	Page 19
Topic 1.2.1 - Test, Diagnose, and Repair Fuel System	Page 38
Job Sheet	Page 52
Topic 1.2.2 - Test, Diagnose, Repair, and Adjust Ignition System Components	Page 62
Topic 1.2.3 - Positive Crankcase Ventilation Service and Final Tune-up	Page 77

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8-7

CURRICULUM OUTLINE
FOR
SPECIAL CONSTRUCTION BATTALION TRAINING

CONSTRUCTION MECHANIC
332.2 ENGINE TUNE UP

Prepared By
U.S. NAVAL CONSTRUCTION TRAINING CENTER
Port Hueneme, CA. 93043

9 October 1974

TABLE OF CONTENTS

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TITLE: CM/GASOLINE ENGINE TUNE-UP (Advanced)

COURSE NO: Special Construction Battalion Training (SCBT)

COURSE LENGTH: 56 Hours, 8 Days

TAUGHT AT: Naval Construction Training Center, Port Hueneme, CA 93043 and
Naval Construction Training Center, Gulfport, MI 39502

CLASS CAPACITY: Normal: 10
Maximum: 12
Minimum: 8

INSTRUCTOR REQUIREMENT PER CLASS: One

COURSE CURRICULUM MODEL MANAGER: NAVCONSTRACEN Port Hueneme, CA 93043

QUOTA MANAGEMENT AUTHORITY: School at which taught.

QUOTA CONTROL: School at which taught.

QUOTA CONTROL: School at which taught.

APPROVAL/IMPLEMENTATION DATA: Chief of Naval Technical Training letter
N335-mjb 1552 Ser 33/118 of 9 Oct 1974

HOW TO USE INSTRUCTOR GUIDES

Instructor guides are provided for each topic and include supporting instructional materials and aids identified by the topic number and preceded by a letter code designation. The letter code key is as follows:

AS - Assignment Sheet
JS - Job Sheet
IS - Information Sheet
CN - Class Notes
OS - Operation Sheet
T - Test
FT - Final Test
TR - Transparencies
DS - Diagram Sheet
PS - Problem Sheet
PT - Pretest
PE - Performance Evaluation
WS - Work Sheet
G - General (give a definition of item)

A complete listing of all supporting materials and aids is documented with full descriptive titles in Annex.

The instructor guides are intended to be used as master lesson plans subject to personalization by the individual instructor. In all cases, it is expected that the instructor will study the references in preparation for annotating the guide. It is also expected that each instructor will develop an appropriate introduction for each topic that will (1) create interest, (2) show the value of the topic to the student, (3) relate the topic to previous and future topics in the course, and (4) communicate the learning objectives to the student. Well-prepared introductions will then provide the important motivational conditioning to establish readiness and effect for learning appropriate to each topic.

The first page of each instructor guide contains the following functional information.

1. Topic of lesson
2. Time in periods
3. References
4. Instructional Aids
5. Instruction Aids
6. Objectives
7. Topic criterion test (as applicable)
8. Homework assignment (when applicable)
9. Tools and materials

The pages following Page 1 of each instructor guide provide in a three-column format the teaching/learning procedures for conducting the lesson. The left-hand column includes the outline of instructional content required by the objectives; the center column includes recommended instructor activities or methodology; the right-hand column contains recommended student learning activities.

COURSE DATA PAGE

COURSE MISSION: To train selected construction mechanics in the knowledge and skill factors defined by the Personnel Readiness and Capability Program for Construction Mechanics Skill 332.2.

PERSONNEL AND RATINGS ELIGIBLE: CM E-4 thru E-6

OBLIGATED SERVICE: None

NOBC/NEC: None

PHYSICAL REQUIREMENTS: None

SECURITY CLEARANCE REQUIRED: None

PREREQUISITE TRAINING AND/OR BASIC BATTERY TEST SCORE REQUIRED: None

RELATED TRAINING: Construction Mechanic "B" School

FOLLOW-ON TRAINING: Engine Tune-Up (Diesel) (Advanced) SCBT Course 334.2

EVALUATION: Unless otherwise specified, performance will be evaluated on a go no-go basis.

OUTLINE OF TRAINING OBJECTIVES

TITLE: GASOLINE ENGINE TUNE-UP II (Advanced) 332.2

Contact Hrs.

UNIT 1.1.1 Introduction and Safety Precautions 1

Terminal Objective: Upon completion of this unit, the student will have registered for the course, received textbooks, complied with NAVCONSTRACEN and CBC regulations governing the reporting and fighting of fires and shop safety procedures which pertained to him as a student at Special Construction Battalion Training.

TOPIC 1.1.1 Introduction and Safety Precautions 1

Enabling Objective: Upon completion of this topic the student will be able to answer orally specific questions pertaining to the mission, regulations and organization of the Command, and the method of reporting/ fighting a fire and the precautions to be observed to ensure personnel safety as established by NAVSCON and CBC regulations.

NOTE: Failure to meet this objective is not considered disqualifying. Information sheet will be kept in possession of student for use if needed.

UNIT 1.2 Gasoline Engine Tune-Up (Advanced) 25

Terminal Objective: Upon completion of this unit the student will be able to perform a complete engine tune-up using appropriate handtools, special tools, and testing equipment. Specifically he will test and diagnose gasoline engine performance in a definite sequence, noting any discrepancies revealed by each test and performing corrective measures to restore the engine to the level specified by the manufacturer without deviation as specified in the manufacturer's specifications and job sheet.

TOPIC 1.2.1 Test, Diagnose, and Repair Fuel System Components 20

Enabling Objective: Upon completion of this topic the student will be able to test, diagnose, and repair gasoline engine fuel system components while using appropriate handtools and test equipment. All performance will conform to manufacturer's specifications without deviation as specified in the Job Sheet 332.2 CM JS 1.2.1.1 "Test and Diagnosis of Fuel System Components" and Ford Shop Manual, Volume Two, Part 10-3, Pages 10-03-01 thru 10-03-04.

TOPIC 1.2.2 Test, Diagnose, Repair and Adjust Ignition System Components . 21

Enabling Objective: Upon completion of this topic the student will be able to test, diagnose, repair, and adjust gasoline engine ignition system components using appropriate handtools and test equipment while complying with manufacturer's specifications, without deviation,

as specified in 1969 Ford Shop Manual, Volume Two, Part 9-1, Pages 09-01-01 thru 09-01-17 "Ignition System Service."

Contact Hrs.

TOPIC 1.2.3 Positive Crankcase Ventilation Service and Final Tune-Up . . 14

Enabling Objective: Upon completion of this topic the student will be able to service positive crankcase ventilation system and perform final tune-up adjustments using appropriate handtools and test equipment. Specifically he will service positive crankcase ventilation system, adjust carburetors idle mixtures, idle speed, fast idle speed (cold engine), and anti-stall dashpot. Check and adjust dwell angle and ignition timing. All performance will conform to manufacturer's specifications without deviation as outlined in 1969 Ford Truck Manual, Volume Two, Part 8-1, Positive Crankcase Ventilation Test, Pages 08-01-07 to 08-01-08 Part 9-1, Dwell Angle Check and Adjustment, Page 09-01-06, Ignition Timing Check, Pages 09-01-11 to 09-01-12 and part 10-1 Carburetor Idle Mixture, Idle Speed, Fast Idle Speed and Anti-Stall Dashpot, Adjustment, Pages 10-01-08 thru 10-01-11.

ANNEX I

TEXTS

Automotive Mechanics, Sixth Edition, Mc Graw-Hill Book Co.

Sun Motor Tester, Model 800, Instruction Manual (portion of entire manual)

Universal Engine Analyzer, Simpson AFC-Pat Handbook

1969 Ford Truck Shop Manual, Vol. Two

ANNEX II

REFERENCES: None

ANNEX III

EQUIPMENT AND MATERIALS

Equipment:

1.	Ford 240 CID Six Cylinder Gasoline Engines, 6 Ea.	$1200.00 ea.
2.	Universal Engine Analyzer, Simpson Model AFC-PAT, 6 Ea.	1500.00 ea.
3.	Sun Model 800 Master Motor Tester, 6 Ea.	2500.00 ea.
4.	Distributor Tester, Sun Model 680, 2 Ea.	1100.00 ea.
5.	Spark Plug Cleaner/Tester, 2 Ea.	225.00 ea.
6.	Positive Crankcase Ventilator Tester C8AZ-6B627-A, 6 Ea	8.00 ea.

Tools:

1.	Mechanic Handtool Kit for 2 men, FSN 6 Ea . . .	553.33 ea.

Materials (Consumables):

1. Cleaning solvent
2. Spark plugs
3. Tune-up kits
4. Wiping rags

TRAINING AIDS ANNEX IV

INSTRUCTOR PREPARED MATERIALS (Local)

1. Job Sheets

   a. 332.2 CM JS 1.2.1.1, Test and Diagnose Fuel System Components

2. Information Sheets

   a. 332.2 CM IS 1.1.1.1 Introduction

   b. 332.2 CM IS 1.1.1.2 Safety Precautions

3. Transparencies

   a. Carter Model YF 1-V Carburetor (exploded view)

   b. Fuel Pumps (various models) exploded view

   c. Distributor assembly (exploded view)

   d. Dwell angle test connection

   e. Ignition timing test connection

   f. Typical conventional ignition system circuit

4. Training chart

   a. Sun Three-Minute Battery Test, Sun Electric Corp., Harlem and Avondale, Chicago, Ill.

5. Film:

   a. MA-8886 - Carburetor Principles of Operation (25 min.)

   b. MA-8701D - Automotive Electricity for Military Vehicles, Part IX, Ignition Circuit (11 min.)

ANNEX V

TRAINING AIDS EQUIPMENT

16MM Projector

ANNEX VI
MASTER SCHEDULE
SCBT COURSE 332.2

FIRST WEEK

TOPIC NO.	TYPE	PERIOD	TITLE	RATIO
FIRST DAY				
1.1.1	C	1	Introduction and Safety Precautions	12/1
1.2.1	C	2	Test, Diagnose, and Repair Fuel System Components	12/1
1.2.1	C	3	" " " " "	12/1
1.2.1	C	4	" " " " "	12/1
1.2.1	C	5	" " " " "	12/1
1.2.1	C	6	" " " " "	12/1
1.2.1	S	7	" " " " "	12/1
SECOND DAY				
1.2.1	S	8	Test, Diagnose, and Repair Fuel System Components	12/1
1.2.1	S	9	" " " " "	12/1
1.2.1	S	10	" " " " "	12/1
1.2.1	S	11	" " " " "	12/1
1.2.1	S	12	" " " " "	12/1
1.2.1	S	13	" " " " "	12/1
1.2.1	S	14	" " " " "	12/1
THIRD DAY				
1.2.1	S	15	Test, Diagnose, and Repair Fuel System Components	12/1
1.2.1	S	16	" " " " "	12/1
1.2.1	S	17	" " " " "	12/1
1.2.1	S	18	" " " " "	12/1
1.2.1	S	19	" " " " "	12/1
1.2.1	S	20	" " " " "	12/1
1.2.1	C	21	" " " " "	12/1
FOURTH DAY				
1.2.2	C	22	Test, Diagnose, Repair, and Adjust Ignition System Components	12/1
1.2.2	C	23	" " " " "	12/1
1.2.2	C	24	" " " " "	12/1
1.2.2	C	25	" " " " "	12/1
1.2.2	C	26	" " " " "	12/1
1.2.2	C	27	" " " " "	12/1
1.2.2	C	28	" " " " "	12/1

ANNEX VI
MASTER SCHEDULE
SCBT Course 332.2

SECOND WEEK

TOPIC NO.	TYPE	PERIOD	TITLE	RATIO
FIRST DAY				
1.2.2	S	1	Test, Diagnose, Repair, and Adjust Ignition System Components	12/1
1.2.2	S	2	" " " " "	12/1
1.2.2	S	3	" " " " "	12/1
1.2.2	S	4	" " " " "	12/1
1.2.2	S	5	" " " " "	12/1
1.2.2	S	6	" " " " "	12/1
1.2.2	S	7	" " " " "	12/1
SECOND DAY				
1.2.2	S	8	Test, Diagnose, Repair, and Adjust Ignition System Components	12/1
1.2.2	S	9	" " " " "	12/1
1.2.2	S	10	" " " " "	12/1
1.2.2	S	11	" " " " "	12/1
1.2.2	S	12	" " " " "	12/1
1.2.2	S	13	" " " " "	12/1
1.2.2	S	14	" " " " "	12/1
THIRD DAY				
1.2.3	C	15	Positive Crankcase Ventilation Service and Final Tune-Up	12/1
1.2.3	C	16	" " " " "	12/1
1.2.3	C	17	" " " " "	12/1
1.2.3	C	18	" " " " "	12/1
1.2.3	C	19	" " " " "	12/1
1.2.3	S	20	" " " " "	12/1
1.2.3	S	21	" " " " "	12/1
FOURTH DAY				
1.2.3	S	22	Positive Crankcase Ventilation Service and Final Tune-Up	12/1
1.2.3	S	23	" " " " "	12/1
1.2.3	S	24	" " " " "	12/1
1.2.3	S	25	" " " " "	12/1
1.2.3	S	26	" " " " "	12/1
1.2.3	S	27	" " " " "	12/1
1.2.3	S	28	" " " " "	12/1

ANNEX VI
MASTER SCHEDULE

TOTAL CLASSROOM PERIODS	19
TOTAL SHOP PERIODS	37
TOTAL PERIODS	56
TOTAL WEEKS	2

NOTE: Each periods represents one contact hour.

NAVAL CONSTRUCTION TRAINING CENTER
SPECIAL CONSTRUCTION BATTALION TRAINING
PORT HUENEME, CALIFORNIA 93043

COURSE TITLE: GASOLINE ENGINE TUNE-UP (Advanced) 332.2

Classification: Unclassified

Topic: Introduction and Safety Precautions

Average Time: Classroom - 1 Period

Instructional Materials:
A. Text: None

B. Reference:

1. NAVCONSTRACEN INST. 5400.4 (Current Series) Organizational Manual of NAVCONSTRACEN

2. "Safety Practices for Shore Activities", NAVMAT P-5100 (Jan 73), Chapter 5

C. Training Aids: None

D. Instructor Prepared Materials (Local):

1. Locally prepared handouts:

a. Introduction I.S. 1.1.1.1

b. Safety Precautions I.S. 1.1.1.2

Terminal Objective: Upon completion of this unit, the student will have registered for the course, received textbooks, complied with NAVCONSTRACEN and CBC regulations, governing the reporting and fighting of fires and shop safety procedures which pertained to him as a student at Special Construction Battalion Training.

Enabling Objective: Upon completion of this topic the student will be able to answer orally specific questions pertaining to the mission, regulations and organization of the Command, and the method of reporting/fighting a fire and the precautions to be observed to ensure personnel safety as established by NAVCONSTRACEN and CBC regulations. NOTE: Failure to meet this objective is not considered disqualifying. Information sheet will be kept in possession of student for use if needed.

Criterion Tests: The student will answer orally specific questions pertaining to the mission, regulations and organization of the Command, and the method of reporting/fighting a fire and the precaution to be observed to ensure personnel safety as established by NAVCONSTRACEN and CBC regulations.

Homework: None

OUTLINE OF INSTRUCTION	INSTRUCTION ACTIVITY	STUDENT ACTIVITY
I. Introduction to the Lesson	1. Introduce self and topic.	Student bring out individual need for this lesson.
A. Establish contact.		Ask questions to clear any doubt or misunderstanding.
1. Name:		
2. Topic: Introduction and Safety Precautions		
B. Establish readiness	2. Motivate student.	
1. Purpose		
2. Assignment		
C. Establish effect	3. Bring out need and value of material being presented.	
1. Value		
a. Pass course.		
b. Perform better on the job.		
c. Get advanced.		
d. Be a better mechanic.		
D. Overview:	4. State learning objectives.	
	a. State information and materials necessary to guide student.	
	b. Notes may be taken.	
	c. Questions.	
	d. Classroom conduct.	
	e. Shop area conduct.	

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
II. Presentation		
A. Introduction		
1. Mission		
a. Special training courses		
b. Higher state of readiness.	5. Stress	
c. Compliance with COMCBPAC Instructions.		
2. Organization and Chain of Command:		
a. Commanding Officer	6. Give names as appropriate	
b. Executive Officer	a. Issue I.S. 1.1.1.1, and I.S. 1.1.1.2 to students.	
c. Training Officer,		
d. School Department Officer		
e. Division Director		
f. Senior Instructor		
g. Primary Course Instructor		
h. Class Petty Officer		
i. Class Safety Petty Officer		
3. Regulations and policies:		
a. Schedule		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
b. Break procedures		
c. Uniform regulations:	7. Maintain a military appearance at all times.	
(1) Working uniform of the day.		
d. Absenteeism		
(1) Must be kept to a minimum.		
(2) Medical or dental sick call.	8. Stress	
(3) Permission to be absent.		
e. Parking		
(1) Where		
(2) When		
(3) How		
f. Visitors and phone calls.		
(1) Emergencies only.		
(2) Phone numbers		
(a) School		
g. Lost or damaged material		
(1) Text books		
(2) Publications		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(3) Tools		
(4) Materials		
(5) Statement of charges		
h. Off-limit areas		
(1) Restricted		
(2) Hard hat		
i. Clean-up procedures		
j. Problems		
(1) Scholastic		
(2) Personal		
(3) Counseling assistance		
4. Standards of student performance.		
a. Written examinations		
b. Homework assignments		
c. Practical application		
5. Course outline		
a. Mission of course		
b. Course objectives		
c. Reading assignments		36

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
d. Class schedule		
6. Grading system		
a. Homework	9. Unless otherwise specified trainee achievement will be evaluated by a combination of oral quizzes, written test and practical performance evaluations. Students must meet all learning objectives in order to pass.	
b. Practical application		
c. Quizzes		
d. Weekly tests		
e. Final examination		
B. Safety precautions		
1. Personnel safety		
a. Tripping hazards	10. Relate personal experience if applicable.	
(1) Tools and equipment		
(a) Hand tools		
(b) Jacks	11. Stress	
(c) Creepers		
(d) Foreign objects		
b. Slippage hazards		
(1) Oil and grease		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(2) Water		
(3) Paper		
c. Eye hazards		
(1) Face mask, goggles		
(2) Hammering, chiseling		
(3) Grinding		
(4) Servicing batteries		
d. Compressed air hazard		
(1) Eye and face		
(2) Skin penetration		
e. Reporting accident		
(1) Class safety man	12. Introduce class safety man.	
(2) Instructor		
(3) School director		
(4) First aid when appropriate.		
2. Fire safety		
a. Avoiding and preventing fires.		
(1) Good housekeeping	13. Stress	
(2) Proper storage of materials.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(3) Smoking		
b. Know evacuation routes.	14. Explain in detail evacuation route.	
(1) Classroom		
(2) Shop area		
c. Reporting fire		
(1) Location of fire alarm switch.		
(2) Report to class safety man.		
d. Fighting fire		
(1) Location of extinguishers.		
III. Application - Oral questions		
IV. Summary:		
A. Introduction		
1. Mission		
2. Organization		
3. Regulations		
4. Standards of Student Performance		
5. Course Outline		
6. Grading System		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
B. Safety		
1. Personnel safety		
2. Fire safety		
V. Test - None		
VI. Homework - None		

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SPECIAL CONSTRUCTION BATTALION TRAINING
NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043

INFORMATION SHEET

INTRODUCTION

1. Organization and Chain of Command

   a. Commanding Officer _____
   b. Executive Officer _____
   c. Training Officer _____
   d. School Department Officer _____
   e. Division Director _____
   f. Senior Instructor _____
   g. Primary Course Instructor _____
   h. Class Petty Officer _____
   i. Class Safety Petty Officer _____

2. Schedule

   a. Classes will convene at 0800 and continue until 1600.

   b. Ten-minute breaks between each class and one hour (1) for lunch.

3. Uniform regulations

   a. Working uniform of the day.

4. Absenteeism

   a. Must be kept to a minimum.

      (1) One complete day is grounds for dismissal.

5. Parking

   a. As directed by the instructor.

6. Visitors and phone calls

   a. Emergencies only

      (1) Ext. - _____

7. Lost or damaged material

   a. Students will be accountable for all books, tools and special equipment when issued to them.

Off-limit areas

a. Set by the instructor.

9. Clean up procedures

a. Daily clean-up every evening.

(1) Areas designated by the instructor.

(2) Senior Class Petty Officer is responsible.

b. Field day held Thursday afternoons.

(1) Area designated by the instructor.

(2) Senior Class Petty Officer is responsible.

10. Problems

a. Chain of Command will be utilized.

b. Major problems will be referred to the student's battalion.

11. Grading system.

a. Emphasis will be placed on the practical application rather than knowledge.

SPECIAL CONSTRUCTION BATTALION TRAINING
NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93041
SAFETY PRECAUTIONS
INFORMATION SHEET
EXERPTS FROM NAVSO P-2455

GENERAL HOUSEKEEPING

1. Cleanliness

A. Floors and other exposed areas

The distribution center, garage, or workshop shall be thoroughly inspected daily and maintained in a clean and orderly state. Floors and other exposed surfaces shall be kept scrupulously clean. Hazards on floors such as oil, grease, or loose tools, which might result in fire, slipping, tripping, or falling shall be eliminated as quickly as possible.

B. Grease Rack

Particular care shall be taken to maintain cleanliness in the area around the grease rack as well as in the rack itself. Be sure that grease connections are fast to car connections when greasing a car. At the close of work each day, clean and grease rack and floor.

2. Ventilation

Garages and repair shops shall be well ventilated for protection of service personnel against accumulations of carbon monoxide. If these spaces are not equipped with adequate ventilation, doors shall be opened whenever engines are running.

3. Illumination

Adequate illumination shall be provided and utilized for all general work areas, including work benches and lubrication pits.

4. Safety During Repairs

Use warning signs or barricades to protect personnel when construction, repair work, or painting is in progress.

5. Avoiding Tripping Hazards

Covers on sidewalk, boxes, fuel tanks, and pipe openings shall be flush with surfaces, and shall be kept closed when not is use. All tools and equipment shall be kept in their proper places when not in use and shall particularly be kept out of walkways to avoid tripping hazards.

PROTECTION OF PERSONNEL

The following personnel protective equipment shall be used by workmen in a distribution center, garage, or workshop.

1. Apparel Required

Mechanics shall wear goggles or face shields, rubber gloves, aprons,

2. Goggles

Goggles shall be worn for all grinding, welding, chipping, cutting, and when using compressed air, or for similar operations designated by local command. The object of tinted filter lenses is not only to diminish the intensity of visible light to a point where glare is reduced to a minimum so that the welding zone can be readily seen, but also to protect the welder from harmful infrared and ultraviolet radiation from the arc of flame.

3. Prohibited Against Rings

Rings shall not be worn by workmen servicing batteries or working on motor vehicles.

FIRE PREVENTION

1. Fire-Fighting Apparatus

Fire fighting apparatus shall be kept in proper working condition and well distributed with locations marked in accordance with NAVDOCKS P-309, APPLICATION OF COLOR TO SHORE ESTABLISHMENTS. Garage personnel should be trained in the operation of this equipment.

2. Smoking

Smoking or the carrying of lighted pipes, cigars, or cigarettes near pumps, batteries, or vent pipes shall be prohibited.

EQUIPMENT AND TOOLS

The pertinent precautions of Chapter 14 apply in addition to the rules in this chapter.

1. General Rules

a. Keep tools in their proper places when not in use.
b. Use only the correct tools for a particular job.
c. Never use defective tools.
d. Keep tools and hands free of grease. Clean tools with an approved solvent.
e. When using a bar on springs, work bar away from the face.
f. Lift small batteries with battery straps designed for this purpose. On large batteries use insulated lifting bridles designed for this purpose.

2. Blow Torches

Blow torches shall not be used to clean crankcases, transmission, radiators or grease guns; steam, hot water or other suitable degreasers shall be employed for this purpose.

3. Grease Guns

Grease guns must be handled carefully and used only for the purpose intended. Serious injury has resulted when grease has been shot out of a grease gun in horseplay. NEVER point the gun toward another person.

4. Lube Dispenser

Keep the dispenser where it will be out of the way, and check it at regular intervals for leaks

5. Mobile Grease Cart

The mobile grease cart must be returned to its proper place immediately after it is used, and the hose must never be left lying along the floor.

REPAIRING AND SERVICING VEHICLES

1. Body and Engine Work

A. Entering the garage. When a car is being driven into a garage , personnel shall stand well out of its path. Never try to service a moving vehicle.

B. Securing the Hood. Work shall not be started under a hood of a vehicle unless the hood has been firmly secured in the open position. Hood holdown clamps or locking devices shall be kept in good condition. Additional holddown clamps should be installed where necessary.

C. Broken Glass. Care shall be taken to avoid injuries from broken windshield, light globes, lenses, or jagged pieces of metal around the car.

D. Radiator. If the radiator is steaming, the hands should be protected with a large rag, and the steam allowed to escape, before removing the cap entirely. Matches shall not be used when looking into a radiator.

E. Cranking the Engine. If it is necessary to crank an engine by hand, the brake must first be set and the gearshift placed in neutral. In cranking the handle should be grasped with the thumb alongside the fingers, and not around the crank. If possible, start the engine by a series of quick pulls. Spinning should always be started with an UPWARD PULL; never with a downward thrust.

F. Lifting Heavy Parts. To prevent personal injury when removing or replacing heavy parts, such as gear units or hub and drum assemblies, mechanics should always use a hoist, jack or dolly.

G. Restriction on Leaded Gasoline. Do not use gasoline containing tetraethyl lead for anything but motor fuel. If this type of gasoline is spilled on the body, wash it off thoroughly, as it is a deadly poison

2. Vehicle Stands. Approved metal vehicle stands shall always be used when work is being done under a vehicle from which the wheels have been removed. Wooden blocks or horses shall not be used for this purpose. Hydraulic lifts are permissible.

3. Dump Trucks. Before starting repairs on a dump truck, with the dump body in a raised position, the body shall be secured by inserting the safety pins in the safety locks, or in the absence of such locks, the body shall be secured with sturdy blocking or triangular steel stands designed for this purpose.

4. Working on Raised Vehicles

a. Jacks

(1) Inspection. Jacks shall be inspected visually for cracks, looseness, and wear. If there is any doubt about the condition of a jack, it must not be used.

(2) Blocking. Be certain that a vehicle is properly blocked when working under it. Do not depend entirely on jacks

(3) Centering. Center the service jack on the axle when a wheel is to be removed from a car. The jack should always be set on a solid footing

(4) Capacity. Never use a jack for a load in excess of its rated capacity.

(5) Handle. Place the jack so that the swing of its handle will be unobstructed. Never leave a jack standing under a load with the handle in the socket

(6) Keeping clear. Never lean over a jack handle or handle socket under load. Keep the body clear of the car, in case it should suddenly start to roll.

b. Hydraulic lifts

(1) Inspection. Inspect hoists at regular intervals for oil leaks, oil level, and proper lubrication. Check overhead connections at regular intervals, and make frequent inspections of safety locks on gears; the teeth of gear locks should not be worn or chipped. Never use a defective hoist.

(2) Putting Vehicle on Lift. Do not stand in front of a hoist while a motor vehicle is being guided onto it

(3) Securing Vehicle. Never permit occupants to remain in a vehicle when it is to be lifted. Be sure, before lifting a vehicle, that the ignition is off, the gears are in neutral, the wheels are blocked, and the doors are closed.

(4) Freewheel lift. If the freewheel type of lift is used, be sure the car is properly balanced. Raise the lift just enough to take the weight off the wheels, check the blocks and knee-action plates to determine whether the car is resting properly, and set the hand brake.

(5) Raising the Hoist

(a) When the hoist is raised, use the safety leg, and check to see that safety catches are secured.

(b) Never rock the car when the hoist is raised

(c) Raise and lower the car slowly. Do not try to rush the action of the hoist, as the gears may slip.

(d) Do not attempt to raise a vehicle that may be heavier than the capacity of the hoist.

(e) Except for cleaning purposes, never raise the hoist when it is not in use.

(6) Self protection during work. When working on raised objects, stand in such a position that your feet will not be crushed if the object should fall

5. Car Pits.

The use of existing pits, elevated racks, and various mechanical lifts for lubrication and other works is acceptable but not recommended except pits used for railroad equipment. Twin post adjustable hydraulic air-oil operated, flush-floor mounted lifts are recommended for this purpose and shall be specified in new construction. In the use of existing pits, the following precautions shall apply:

a. Only approved cleaning compounds shall be used in car pits. Never use gasoline or other flammable solvents

b. Do not place tools or debris on pit steps and always keep the steps free of oil and grease

c. Arrange for proper lighting in the pits

d. Keep the drain open

e. Erect adequate safeguards around pits

f. Do not allow unauthorized personnel in pits

g. Keep guard chains for pits in place when the pits are not in use

6. Charging Batteries.

a. Beware of burns and shocks when charging batteries. Use rubber gloves when necessary.

b. Vent caps should be replaced before attaching or detaching charger cable; fumes arising from batteries in the recharging line are flammable.

c. Be sure that connections to batteries are properly made and secured

d. Care shall be used in handling battery acids. When preparing electrolyte, the acid shall always be poured into the water

e. Never "flash" or short-circuit a battery to test its strength. As stated above, the hydrogen gas is highly inflammable and a spark may cause an explosion.

7. Installing Tires.

a. Removing Hub Cap. When removing a hub cap, hold one hand against the side of the cap so that it does not fly into your body when it is released.

b. Removing the Tire. When removing a tire from a wheel, remove the core from the valve stem and turn the wheel until the valve sten is on the

lower quarter; then pull the tire opposite the stem. This saves lifting the tire, which can be rolled off the wheel onto the ground. Such a procedure is particularly useful when changing truck or bus tires.

c. Cracked Rims. In replacing tires, take care that the rims are in good condition and that the lug nuts are tight

d. Lock Rings. See that the lock rings are properly installed. This should be done before the tire is fully inflated.

e. Inflating the Tire. Inspect a tire for defects and determine the proper pressure before inflating. When inflating a tire, turn your face away from it; never hold it between your legs. Tires on split wheels must be deflated before removing the wheel from the vehicle and inflated after installing the wheel on the vehicle.

f. Installing Tire on Wheel. When putting a tire on a wheel, turn the wheel until the opening for the valve stem is on top. Then, resting the tire against the wheel with the stem on top, stoop, place a hand on each lower quarter of the tire, and lift it into place.

g. Split Wheels. All bolts on split or two piece wheels must be tightly secured before inflating tire. Tire must be deflated before loosening bolts

8. Sodium Filled Valves. Autmotive shop mechanics and supervisors shall be familiar with the hazards of the metallic sodium found in "sodium filled" engine valves. Special provision shall be made for the temporary storage and disposal of the parts when they are replaced. They shall not be discarded to the metal scrap pile, but shall be shipped to the nearest naval ammunition depot for proper disposal. They shall be appropriately tagged for identification.

FUELING MOTOR VEHICLES.

1. Authorized Personnel. Only authorized personnel shall be allowed to fuel motor vehicles, and they shall have a thorough knowledge of the hazards involved.

2. Care of pumps.

a. If the pump is electrically operated, be sure that the motor is shut off after the gasoline has been delivered.

b. Check at regular intervals for leaks at pipe connections, stuffing box, and meter. If leaks are found, do not attempt to repair them. Call a repairman, and keep the pumps out of service until the repairs have been made.

c. Have the base bolts secure at all times

d. Do not attempt to make electrical repairs on pumps. Call a serviceman.

3. Using Fueling Equipment

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a. Equipment Maintenance. Do not use leakey hose, pumps, valves, or faucets. Arrange for them to be repaired at once.

b. Gasoline Containers. Gasoline shall not be left standing in unlabeled containers; metal safety cans must always be used. If gasoline is to be carried away, it shall be done only when in the metal safety can, tightly capped, and suitably marked.

c. Autmoatic Dispensing Nozzles. Automatic shut-off dispensing nozzles may be used without attendance, only if the nozzles are approved and listed as such, with limitation by the Underwriter's Laboratories, Inc. When such nozzles are used without attendance, the following precautions shall be observed

(1) The engine and lights of the vehicles being fueled shall be shut off.

(2) Exhaust extensions of operating internal combustion engines shall be at least ten feet from the point of fuel delivery.

(3) Each automatic shut-off nozzle shall be checked daily by attendants for wear or damage; shall be checked weekly by the station fire department personnel; and removed and repaired or adjusted by a manufacturer's representative at six-month intervals or after 50,000 cycles of operation, whichever comes first. Records of these inspections shall be kept by the service station

(4) A 50-pound wheeled CO_2 or 30-pound dry chemical extinguisher shall be provided at each service station where such nozzles are used

(5) Attendants shall be fully instructed in the regular inspection of the automatic shut off nozzles and the use of the fire extinguishers.

4. Fueling Procedure

a. Bonding. To prevent electrical static discharges, tank and nozzle shall be kept in metallic contact while gasoline is being poured into the fuel tanks. This rule applies to all kinds of motor vehicles, and especially to gasoline trucks

b. Proximity to Antennas. The fueling of motor vehicles in the proximity of antennas and antenna down leads should be avoided or conducted with special precautions. An ungrounded automobile, ungrounded filling nozzle, or merely the attendant's body in close proximity to transmitting antennas and down leads, may produce sparks sufficient to ignite gasoline vapor when the nozzle comes in contact with the tank opening. Pump nozzles must be grounded at all times, and motor vehicles, when fueling, must also be grounded before opening the tank.

c. Danger from Fumes. To minimize the effects of gasoline fumes, the face should be turned away from the fuel pipes while making deliveries of gasoline. Always drain the nozzle before removing it from the tank of a vehicle

d. Battery Terminals. If the gasoline tank is located under the seat, do not permit the nozzle to touch the battery terminals.

e. Danger of Overfilling. Take special care that fuel tanks are not filled to overflowing. This is particularly important in the case of motorcycles.

5. Fire During Fueling. If fire should break out in the fuel spout during fueling, remove the hose from the tank immediately and smother the fire with CO_2, dry chemical, or foam extinguishers, dirt, sand or a wet cloth (preferably chamois, if it is available).

6. After-Fueling procedures.

a. Caps and Plugs. Replace caps or plugs securely immediately after using drums or barrels containing gasoline. Caps and plugs should be in place when drums or barrels are empty, and these containers should be removed from the garage as soon as possible

b. Pumps. If the gasoline pump is of the visible bowl type, drain the gasoline from the bowl when securing the pumps.

c. Measuring Cans. Turn empty measuring cans bottom up and dry them thoroughly before storing them.

d. Personal Hygeine. After handling gasoline, mechanics should wash their hands thoroughly before eating. Clothing that has become soaked with gasoline should be changed immediately, to prevent possible burns and dermatitis of the skin. Gasoline soaked rags should never be carried in the pocket.

NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043

SCBT 332.2 CM IG 1.2.1

SCBT COURSE 332.2

COURSE TITLE: GASOLINE ENGINE TUNE-UP II (Advanced)

Classification: Unclassified

Topic: 1.2.1 Test, Diagnose, and Repair Fuel System Components

Average Time: Class: 6 Periods Shop: 14 Periods

Instructional Materials:

A. Text:

1. Automotive Mechanics, Sixth Edition, Mc Graw-Hill Book Co.
2. 1969 Ford Truck Shop Manual, Volume Two, Part 10
3. Universal Engine Analyzer, Simpson Model AFC-Pat Handbook
4. Sun Model 800 Motor Tester Instruction Manual (portion of entire manual).

B. Training Aids:

1. Film:
   a. MA-8886 "Carburetor Principle of Operation (25 min.)

C. Instructor Prepared Materials (Local):

1. Job Sheet

Terminal Objective: 1.2

Enabling Objective: Upon completion of this topic the student will be able to test, diagnose, and repair gasoline engine fuel system components while using appropriate handtools and test equipment. All performance will conform to manufacturer's specifications without deviation as specified in the Job Sheet 332.2 CM JS 1.2.1.1 "Test and Diagnose of Fuel System Components", and Ford Shop Manual Volume Two, Part 10-3, Page 10-03-01 thru 10-03-04.

Criterion Tests:

A. Using appropriate tools and test equipment, the student will test and diagnose fuel system components as outlined in the job sheet (332.2 CM JS 1.2.1.1) "Test and Diagnosis of Fuel System Components" without deviation.

B. Using appropriate handtools and special carburetor tools provided and following the manufacturer's specifications and recommendations as outlined in the Ford Shop Manual, Volume Two, Part 10-3, Pages 10-03-01 thru 10-03-01 thru 10-03-04, the student will repair and adjust the Carter Model YF 1-V Carburetor used on Ford 240 CID Six Cylinder Engine, without deviation.

C. Instructor Prepared Materials (Local): (Cont.)

a. 332.2 CM JS 1.2.1.1 "Test and Diagnose Fuel System Components".

2. Transparencies

a. Carter Model YF 1-V Carburetor exploded view

b. Fuel pumps (various model) exploded view

D. Equipment

1. Major

a. Ford 240 CID Six Cylinder Gasoline Engines

b. Carburetors and Fuel Pumps

2. Test Equipment

a. Universal engine analyzer, Simpson Mod. AFC-Pat

b. Sun Model 800 Master Motor Tester

3. Tools

a. Automotive handtools

b. Special tools

c. Shop equipment

Homework: Read: Automotive Mechanics, 6th Edition, Mc Graw-Hill Book Co., Chapter 20, 1969 Ford Truck Shop Manual, Volume Two, Part 10-1 and 10-3.

4. Materials (consumables)

   a. Carburetor repair kits

   b. Fuel pump repair kits

   c. Cleaning solvents

   d. Lubricants

   e. Wiping rags

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the Lesson	1. Introduce self and topic.	
A. Establish contact.		
1. Name:		
2. Topic: Test, Diagnose and Repair Fuel System Components		
B. Establish readiness	2. Motivate student.	
1. Purpose		
2. Assignment		
C. Establish effect	3. Bring out need and value of material being presented.	
1. Valve		
a. Pass course.		
b. Perform better on the job.		
c. Get advanced.		
d. Be a better construction mechanic.		
D. Overview:	4. State learning objectives.	
1. Fuel-system troubles usually show up in engine operation, causing troubles such as poor acceleration, missing, loss of power, failure to start, backfiring, stalling, and so forth. An engine tune-up will disclose malfunctioning fuel-system components, since the carburetor and fuel pump are checked during tune-up jobs. In this lesson the proper procedure of checking/testing the carburetor circuits, the fuel pump, and servicing/repairing the fuel system will be discussed.	a. State information and materials necessary to guide student.	

OUTLINE OF INSTRUCTION

II. PRESENTATION

A. Test and Diagnose

1. Carburetor

NOTE: A number of quick checks can be made that will give a rough idea of whether the various carburetor circuits are functioning satisfactorily. The accurate analysis of carburetor operation requires the use of an exhaust-gas analyzer and an intake-manifold vacuum gauge.

a. Visual checks

(1) Float level adjustment (at idle speed).

(a) High-speed nozzle tip is wet or discharging gasoline.

1 Float level setting too high.

(2) Low speed and idle circuits.

(a) Engine does not idle smoothly.

1 Idle circuit is malfunctioning.

(b) Engine speed does not increase evenly, (at 25 MPH), and runs roughly.

1 Low speed circuit out of order.

(3) Accelerator-pump circuit

(a) Open the throttle suddenly.

INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
5. Issue text books.	
6. Refer to Chap. 20. "Automotive Mechanics, Sixth Edition, Mc Graw-Hill Book Co.	1. Refer to pages in text as designated by the instructor.
	2. Take notes.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
1 Flow of gasoline into the air horn should continue for an instant after the throttle reaches the "open" position.		
(4) High-speed circuit		
(a) At approximately 24 MPH slowly cover part of the air horn with a piece of cardboard.		
1 Engines does not speed up somewhat.		
a High-speed circuit is malfunctioning.		
NOTE: The foregoing check results should not be considered final.		
b. Intake-manifold vacuum test		
NOTE: This is an important engine test for determining troubles in an engine that runs but does not perform satisfactorily.		
(1) Vacuum varies with different operating conditions, and also with different engine defects.		
(2) A steady and fairly high reading (17 to 22 inches), depending on altitude and engine.	7. Explain the meaning of various vacuum readings refer to Chap. 26, Pages 379-380, "Automotive Mechanics", 6th Edition, Mc Graw-Hill Book Co.	3. Take notes.
(a) Indicates normal performance.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(3) A very low reading.		
(a) Indicates a leaky manifold or carburetor gasket.		
(b) Indicates leakage around the throttle-valve shaft.		
(4) Floating motion or slow oscillation of the needle.		
(a) Excessively rich air-fuel mixture.		
c. Combustion efficiency test:	8. Refer to the Sun Engine Performance handbook for proper instrument connections.	
NOTE: Combustion efficiency is a very reliable indication of carburetor system operation of a mechanically sound, properly timed engine with a good ignition system.		
(1) Using exhaust-gas analyzer.		
(a) Check the exhaust gas to determine what percentage of gasoline has not been burned.		
1 The richer the fuel ratio - the lower the combustion efficiency.		
2 Incorrect mixture ratios, fouled spark plugs, or sticking valves.		
a Not all the gasoline burns.		
d. Choke systems:		
(1) Automatic		68

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(a) As a rule, no service is required once it is adjusted for the operating conditions of the engine.		
(b) Engine stalls; cold or as it warms up.		
1 Choke valve stuck in closed position.		
(c) Excessive fuel consumption		
1 Choke valve partly closed after warm-up.		
(2) Manual		
(a) Check for broken pull rod.		
(b) Partly closed valve.		
1 Excessive fuel consumption.		
2 Adjust as required.		
2. Fuel pumps	9. Refer to Fig. 21 and 22, Pages 21 and 22, "Fuel Pump Test", Simpson Model Pat Handbook.	
a. Pressure test		
(1) Measured in PSI.		
(a) Compare to specifications.		
(2) Low pressure		
(a) Fuel starvation		
(b) Poor engine performance.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(3) High pressure		
(a) Over-rich mixture.		
(b) Excessive fuel consumption.		
b. Volume test		
(1) Certain amount of fuel delivered in a given time.		
(a) Compare to specifications.		
(2) Insufficient fuel delivery.		
(a) Broken, worn out, or cracked diaphragm.		
(b) Improperly operating fuel-pump valves.		
(c) Broken or damaged rocker arm.		
(d) Clogged fuel line or filter.		
(e) Air leak		
(f) Vapor lock		
c. Vacuum test		
(1) Reading in inches of mercury.		
(a) Compare to specifications.		
NOTE: Unless otherwise specified, fuel pump vacuum should not be less than 10.0 inches.		

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(2) Vacuum reading should remain constant and not decrease after the engine is stopped.		
NOTE: Repair of replace the fuel pump if it does not meet the manufacturer's specifications.		
3. Fuel lines and filters		
a. Visually check all lines.		
(1) Leakage and or restriction.		
(a) Fuel starvation		
b. Clean or replace filter/s as required.		
(1) Clogged filter screen or filter.		
(a) Fuel starvation		
4. Fuel tank		
a. Check for leakage.		
b. Check the vehicle vapor recovery system if equipped.		
c. Clean as required.		
B. Rebuild of Fuel System Components	10. Show transparency, Carter Model YF 1-V Carburetor, exploded view or show actual carburetor.	4. Examine carburetor and pass to next student.
1. Carburetor		
a. Removal		
(1) Use appropriate tools.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(2) Remove air cleaner and related parts.		
(3) Disconnect the throttle and choke linkages.		
(4) Disconnect fuel and vacuum lines.		
(5) Disconnect wires from switches and other electric control (where present).		
(6) Remove carburetor attaching nuts or bolts.		
(7) Lift off the carburetor and place on a clean workbench.		
b. Disassembly and assembly procedures		
(1) Vary according to their designs.		
(2) Following manufacturer's recommendations.		
(3) Special carburetor tools are required.		
(4) Use the correct carburetor overhaul kits.		
(5) Important safety precautions should be observed at all times.		
c. Installation		
(1) Reverse the removal procedure.		
(2) Make idle-speed idle-mixture, and other adjustment.		
2. Fuel pump (machanical)		
a. Removal		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(1) Use proper tools. (2) Wipe any dirt or accumulated grease off the pump. (3) Disconnect fuel lines and vacuum pump lines (on a combination pump). (4) Remove attaching nuts or bolts, and lift off the pump. (5) Remove push rod if equipped. (a) Check for wear. b. Disassembly and assembly procedures. (1) Vary according to their design. (2) Follow manufacturer's recommendations and shop manual on specific models. (3) Use the correct repair kits. NOTE: Most late-model fuel pumps are assembled by crimping and cannot be disassembled. If defective, they must be replaced with a new assembly. c. Installation (1) Connect the fuel and vacuum line to the pump. (2) Place new gasket on the studs over the crankcase opening.	11. Show transparency, fuel pump, exploded view, or show actual fuel pump.	5. Examine fuel pump and pass to next student.

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OUTLINE OF INSTRUCTION

(3) Install pump without forcing or prying into place.

(a) Attach with bolts or nuts.

(4) Check pump operation.

3. Fuel pump (electric)

a. Replace unit if defective.

4. Fuel lines

a. Replace lines or tubes if defective.

b. Replace connections (fittings) if defective.

(1) Flare the ends of the line/s with flaring tool.

(a) Remove metal chips from side the tubing.

c. Check the connections for leaks.

III. APPLICATION:

A. Trainee will test, diagnose and rebuild fuel system components using appropriate tools and testing equipment provided and following manufacturer's specifications and recommendations.

IV. SUMMARY:

A. Test and Diagnose

1. Carburetors

INSTRUCTOR ACTIVITY

12. Direct, supervise and evaluate student performance in testing, diagnosing troubles, and repairing gasoline engine fuel systems while complying with manufacturer's specifications without deviation.

STUDENT ACTIVITY

6. Test, diagnose and rebuild fuel system components as directed by the instructor, while complying with manufacturer's without deviation.

OUTLINE OF INSTRUCTION

2. Fuel pumps

3. Fuel lines and filters

4. Fuel tank

B. Rebuild of Fuel System Components

1. Carburetor

2. Fuel pumps

3. Fuel pump (electric)

4. Fuel lines

V. Test:

A. Criterion Test

VI. ASSIGNMENT:

A. Read:

1. Automotive Mechanics, Sixth Edition, Mc Graw-Hill Book Co., Chapter 15.

2. 1969 Ford Shop Manual, Volume Two, Part 9-1

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INSTRUCTOR ACTIVITY

13. Establish instructor check points in the appropriate manuals prior to the student performance test.

STUDENT ACTIVITY

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SPECIAL CONSTRUCTION BATTALION TRAINING
NAVAL CONSTRUCTION TRAINING CENTER
PORT HUENEME, CALIFORNIA 93043

STT COURSE #332.2

GASOLINE ENGINE TUNE-UP II (ADVANCED)

JOB SHEET

TEST AND DIAGNOSIS OF FUEL SYSTEM COMPONENTS

INTRODUCTION: The purpose this this job sheet is to guide you in the practical performance of testing and diagnosing gasoline engine fuel system components using the appropriate tools and test equipment provided and following the specific procedures as given in this job sheet. These will cover carburetor visual checks, combustion efficiency tests, fuel pump pressure, volume and vacuum test, and fuel filter/s, lines and tank checks. At the designated points on the job sheet the instructor will inspect procedures to determine job errors and safety procedures before the team may proceed to the next procedure. Individual and team performance must be in accordance with the job sheet and manufacturer's specifications and recommendations, without deviation.

TOOLS AND EQUIPMENT:

1. Gasoline engines
2. Mechanic handtools
3. Universal engine analyzer, Simpson Model AFC-Pat
4. Sun Model 8000 Motor Tester
5. Shop equipment

CONDITIONS:

1. Student teams of two (2) students each will be assigned to a gasoline engine to accomplish the testing and diagnosing of gasoline engine fuel system components.

2. Each team will be provided with all the required tools, test equipment, manuals, and a job sheet.

3. Preceding the shop performance all aspects of the job with necessary background data is covered in the classroom lecture/discussion.

PROCEDURES: Check with the instructor at each stop.

A. Test and diagnose

NOTE: A number of quick checks can be made that will give a rough idea of whether the various carburetor circuits are functioning satisfactorily. The results of these checks should not be considered final. Accurate analysis of carburetor operation requires the use of an exhaust-gas and an intake manifold vacuum tester.

1. Carburetor

a. Visual checks

(1) Check float-level adjustment.

(a) Start engine and run at idle speed.

(b) Remove air cleaner and note the condition of the high-speed nozzle.

1 If the nozzle is wet or is discharging gasoline, the probability is that the float level is high.

(2) Check low-speed and idle circuits.

NOTE: If the engine does not idle smoothly, the idle circuit is malfunctioning.

(a) Slowly open the throttle to give about 25 miles per hour engine speed.

1 Low-speed circuit is out of order, if the speed does not increase evenly and the engine runs roughly through this speed range.

(3) Check accelerator - pump circuit.

(a) Engine stopped

(b) Open the throttle suddenly and note whether the accelerator - pump circuit discharges a flow of gasoline into the air horn.

1 The flow should continue for an instant after the throttle reaches the open position.

(4) Check high-speed circuit

(a) Start the engine.

(b) Open the throttle to give about 25 miles per hour engine speed.

(c) Slowly cover part of the air horn with a piece of stiff cardboard.

1 The engine should speed up slightly.

2 High speed circuit is not working properly if the engine does not speed up somewhat.

NOTE: The foregoing check results should not be considered final.

(5) Check choke systems (automatic or manual).

NOTE: Automatic choke, as a rule, requires no service once it is adjusted for the operating conditions of the engines.

(a) With air cleaner removed, check automatic choke valve position.

1 Stuck in closed position will cause engine to stall when cold or as it warms up.

2 Choke valve partly closed after warm-up will cause excessive fuel consumptions.

3 Adjust as required.

(b) Check manual choke for broken push rod.

1 Replace or adjust as required.

STOP: Instructor Check Point _____

b. Combustion efficiency tests:

NOTE: Combustion efficiency is a very reliable indication of carburetor system operation on a mechanically sound, properly timed engine with a good ignition system. Combustion efficiency is tested by utilizing exhaust gas samples picked up at the tail pipe to determine the fuel to air ratio, and indicates this information on an electric meter. To obtain accurate test results, the engine must be at operating temperature.

Before testing, determine that both compression and ignition of the engine are in good condition, and that the exhaust system does not leak in order to assure accurate results.

While oil smoke from a car does not materially affect the accuracy of the tester during the test, repeated use of a combustion efficiency tester on oil burning engines will eventually decrease its sensitivity because of oil fouling.

(1) Preparation for tests:

(a) Connect a tachometer to the engine.

(b) Connect the vacuum gauge to the intake manifold.

(c) With power cord of tester plugged into a suitable receptacle, set master switch to "ON" position.

(d) Rotate combustion regulator clockwise from "OFF" position, and allow unit to warm up.

(e) Connect one end of neoprene hose to exhaust condenser, and the other end to fitting on combustion vacuum unit.

(f) Adjust combustion regulator until meter pointer reads on SET LINE. (80%)

(g) Insert metal pickup hose of exhaust condenser into tail pipe of vehicle. (With dual exhaust, use side opposite manifold head control valve).

STOP: Instructor Check Point _____

(2) Idle mixture test:

(a) Adjust engine speed to specified idle RPM.

(b) Note reading on combustion efficiency meter. The most desirable idle mixture for the majority of passenger vehicles is 72 to 76 percent.

(c) Make fine adjustments, moving each carburetor idle mixture screw to obtain the desired setting.

(d) Note idle speed and reset as necessary to manufacturer's specifications.

1 Idle mixture reading ranges from 72 to 76 percent . . . idle speed and idle mixture screw settings satisfactory.

2 Too lean (to the left) . . . incorrect idle mixture adjustments, low float level, plugged idle jets or air leaks.

3 Too rich (to the right) . . . incorrect idle mixture adjustment, high float level, or plugged air bleeds.

4 Little or no change in meter reading when idle mixture adjustment is changed . . . plugged idle passages or carbon over idle ports.

5 Meter reading drifts . . . worn needle and seat, fuel pullover from high-speed nozzle or accelerator pump jet, improper float level, or leaky power valve.

STOP: Instructor Check Point _____

(3) Intake manifold leak test

(a) Using a squirt can, apply a mixture of engine oil and kerosene to the carburetor flange fasket and intake manifold gaskets. (Do not apply this mixture near the choke heat riser tube as it will cause a false meter indication).

(b) Observe combustion meter for any unusual deflections towards the rich side (right).

CAUTION: Because this mixture is combustible, care should be exercised in its use. Keep a fire extinguisher handy.

1 No observed meter deflection . . . manifold and gaskets airtight.

2 Meter pointer deflects more than 3 percent to the right (rich) . . . leaky intake manifold gaskets, cracked or warped intake manifold, loose carburetor, or loose manifold mounting bolts.

STOP: Instructor Check Point _____

(4) Carburetor mixture curve:

(a) Accelerate engine slowly, pausing at each designated speed long enough to permit combustion efficiency meter to stabilize and observe for reading recommended:

RPM	COMB. EFF.
800	
1000	78% - 82%
1200	

NOTE: These readings have been found the most desirable for economy during no-load carburetor testing as pertaining to most passenger cars and light trucks.

RPM	COMB. EFF.
1500	
1800	84% - 88%
2000	
2200	

1 Meter reading within specifications for listed engine speeds . . . carburetor action satisfactory.

2 Too lean (to the left) . . . low float level, incorrect metering rod adjustment or metering jets, plugged high-speed passages or jets, manifold or carburetor air leaks.

3 Too rich (to the right) . . . high float level, leaky power valve, leaky accelerator pump or check valve, incorrect metering rod adjustment, incorrect metering jets, plugged air bleeds or restricted air cleaner.

4 Meter reading drifts . . . worn needle and seat,. fuel pullover from: high-speed nozzle, accelerator pump jet, improper float level, or leaky power valve.

STOP: Instructor Check Point _____

(5) Accelerator pump test:

(a) Set engine speed to 1000 RPM and allow combustion reading to stabilize.

(b) Accelerate quickly to approximately half throttle and lower speed back to 1000 RPM.

(c) Observe combustion meter for amount of temporary enrichment (deflection to the right). Should be minimum of 8 percent.

1 Meter shows a minimum of 8 percent temporary enrichment. ... accelerator pump action satisfactory.

2 Little or no change in meter reading . . . insufficient pump stroke, leaky check valve, worn linkage, or worn plunger.

STOP: Instructor Check Point _____

(6) Air cleaner test:

(a) With engine operating at 2000 RPM.

1 Observe combustion meter reading with air cleaner in place on carburetor.

2 Observe combustion meter reading with air cleaner removed from carburetor.

(b) Compare meter readings observed in previous step.

1 Little or no difference indicated in the two meter readings just observed . . . air cleaner not restricting flow of air.

2 Greater than 5 percent difference noted in two meter readings just observed . . . air cleaner restriction is indicated.

NOTE: Some air cleaners have built-in restriction which will cause considerable leanness of the air-fuel ratio when the air cleaner is removed. Consult manufacturer's data.

STOP: Instructor Check Point _____

(7) Final idle adjustment

(a) Reduce engine speed to idle.

(b) Observe idle RPM, combustion efficiency reading and vacuum readings.

(c) Adjust carburetor idle mixture for highest, smoothest vacuum. Idle should be smooth with mixture and speed within specifications.

NOTE: Experience is the best guide in determining the normal vacuum for any given engine. Normal manifold vacuum ranges from 15" to 22" on various engines. On late model engines, lower and less steady vacuum is increasingly common, because of the greater use of high lift cams and more valve overlap.

(d) Test results:

1 High, steady vacuum, mixture and speed within specifications. . . proper carburetor adjustment, correct timing.

2 Vacuum reading lower than normal but steady . . . late ignition timing, late valve timing, low compression or excessive mechanical drag in engine.

3 Vacuum reading abnormally unsteady . . . improper carburetor idle mixture, distributor points faulty, spark plugs improperly gapped, faulty valve adjustment, fouled or dirty spark plugs, manifold air leaks, uneven compression, or improper carburetor action.

(e) After completing the test series, stop engine before disconnecting test leads, pickups, hoses, or accessories required for performing the tests. Be sure all vehicle electric, fuel, and vacuum connections are secure before restarting the engine.

NOTE: Allow combustion tester to operate approximately 5 minutes after removing the hose to expel any moisture that has accumulated in the unit.

STOP: Instructor Check Point _____

(8) Securing combustion tester:

(a) After completing the combustion tests, pull the exhaust hose off the meter panel and allow the booster to continue running for about 5 minutes to evaporate any trace of moisture in the instrument.

(b) Drain all water from the hose and the pickup and remove the water from the auxiliary condenser if used, then place the hose in a dry place.

CAUTION: Under no conditions should compressed air be used in an attempt to remove moisture from the tester.

STOP: Instructor Check Point _____

2. Fuel pumps

a. Preparation for tests

(1) Start engine and operate at fast idle with hood closed until engine and fuel system are at normal temperature, stop engine.

(2) Remove carburetor air cleaner and disconnect fuel line at carburetor inlet.

NOTE: When more than one carburetor is used, disconnect fuel line at tee connection of junctions.

(3) Connect fuel pump tester inlet hose to disconnected fuel line.

NOTE: Be sure inlet hose is securely connected to fuel line. If necessary, move retaining nut away from end of fuel line to prevent interference with inlet hose.

(4) Connect tachometer to engine.

b. Fuel pump pressure test

(1) Start engine and operate at idle speed or speed specified for fuel pump pressure test.

(2) Observe pressure gauge reading and compare to specifications for fuel pump pressure.

STOP: Instructor Check Point _____

c. Fuel pump volume test

(1) With engine operating at idle speed or speed specified for fuel pump volume test, direct tester discharge hose into a suitable fuel container.

(2) Press capacity test button down and observe fuel gauge reading. Compare to specifications fuel pump capacity or volume.

(3) Release capacity test button.

(4) Stop engine and disconnect tester inlet hose from fuel line to carburetor inlet or tee connection and replace air cleaner.

STOP: Instructor Check Point _____

d. Fuel pump vacuum test

(1) Disconnect fuel inlet and outlet lines from fuel pump.

(2) Connect fuel pump tester inlet hose to pump inlet.

NOTE: If necessary, remove fitting or flexible hose from fuel pump and use 1/8" pipe adapter furnished.

(3) Start engine and operate at idle speed or speed specified for fuel pump vacuum test until highest vacuum gauge reading is obtained.

(4) Observe final gauge reading and compare to specifications for fuel pump vacuum. Unless otherwise specified, fuel pump vacuum should not be less than 10.0 inches.

(5) Stop engine and observe vacuum gauge for about 15 seconds. Vacuum reading should remain constant and not decrease after engine is stopped.

STOP: Instructor Check Point _____

3. Fuel filters, lines and tank

a. Clean or replace fuel filter/s as required.

b. Visually check fuel lines for leakage and/or restriction.

c. Check fuel tank for leakage and condition.

d. Check the vehicle vapor recovery system if equipped.

STOP: Instructor Check Point _____

B. Cooperation with team effort

1. Gives and takes directions equally well.

2. Correctly interprets instructions.

3. Communicates in a friendly manner.

4. Performs efficiently.

C. Use of tools and test equipment

1. Accurate tool selection.

2. Safe application of tools.

3. Reading and interpretation of test equipment

D. Shop safety

1. Handling of fuels

2. Handling of lubricants

3. Handling shop equipment

4. Good housekeeping

5. Observes posted safety precautions

6. Conforms to smoking regulations.

NAVAL CONSTRUCTION TRAINING CENTER
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SCBT 332.2

COURSE TITLE: GASOLINE ENGINE TUNEUP (ADVANCED)
Classification: Unclassified.

Topic: 1.2.2 Test, diagnose, repair, and adjust ignition system components.

Terminal Objective: 1.2

Average Time: Class: 7 periods.
Shop : 14 periods.

Instructional Materials:

A. Text:

1. Automotive mechanics, sixth edition, Mc Graw Hill Book Co.

2. 1969 Ford truck shop manual, volume two part 9.

3. Universal engine analyzer, Simpson model AFC-PAT handbook.

B. References:

1. Instruction manual, Sun distributor tester.

2. Training manual "Better Ignition", DR 5141, Delco-Remy Division, GMC, Anderson, Indiana.

C. Training Aids.

1. Film:

a. MA 8701D Automotive electricity for military vehicles, Part IV , Ignition circuit, (11 min.)

Enabling Objectives: Upon completion of this topic the student will be able to: test, diagnose, repair, and adjust gasoline engine ignition system components using appropriate handtools and test equipment.

While complying with manufacturer's specifications, without deviation, as specified in 1969 Ford shop manual, volume two 09-01-17. Ignition System Service.

D. Instructor Prepared Materials (Local):

1. Transparencies:

a. Typical conventional ignition system circuit.

b. Distributor assembly (Exploded view).

2. Training Chart.

a. Sun three minute battery test, Sun Electric Corp., Harlem and Avondale, Chicago, Illinois.

E. Equipment:

1. Major.

a. Ford 240 CID six cylinder gasoline engines.

2. Test Equipment:

a. Universal engine analyzer Simpson model AFC-PAT.

b. Distributor tester, Sun model 680.

c. Spark plug cleaner/tester.

3. Tools:

a. Automotive handtools

b. Special tools

c. Shop equipment.

Criterion Tests:

Using tools and test equipment provided and following manufacturer's specifications and recommendations the student will test, diagnose, Repair and adjust ignition system components. All performance will conform to the procedures designated by the instructor as outlined in : 1969 Ford Shop Manual, Volume Two, Part 9-1. primary and secondary circuit tests and adjustments, and distributor centrifuggal and vacuum advance tests and adjustments with-out deviation.

Homework:

Read: Automotive mechanics, sixth edition. McGraw Hill Book Co. ch. 15.

1969 Ford Shop Manual, Volume Two. part 9-1.

4. Materials (consumables)

   a. Tune-up kits

   b. Spark plugs

   c. Cleaning solvent

   d. Lubricants

   e. Wiping rags

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the Lesson	1. Introduce self and topic.	
A. Establish contact.		
1. Name:		
2. Topic:		
B. Establish readiness	2. Motivate student.	
1. Purpose		
2. Assignment		
C. Establish effect	3. Bring out need and value of material being presented.	
1. Valve		
a. Pass course.		
b. Perform better on the job.		
c. Get advanced.		
d. Be a better construction mechanic.		
D. Overview: In this lesson the procedures of checking, testing and servicing of the ignition system components will be discussed. These components consist of the ignition, distributor spark plugs, wiring, and ignition coil, as well as the battery.	4. State learning objectives.	
	a. State information and materials necessary to guide student.	

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
II. Presentation:	5.) Refer to part 9-1, ignition system service 1969 Ford shop manual. Volume two.	
A. Test and diagnose.		
1. Ignition primary circuit test.		1.) Refer to pages text as directed by instructor.
Note: Breakdown and energy loss in the primary circuit can be caused by : defective primary wiring or loose/corroded terminals; burned, shorted or improperly adjusted breaker points, defective coil, or defective condenser. Excessive voltage drop in the primary circuit will reduce the secondary output of the ignition coil, resulting in hard starting and poor performance.		
a. Test battery to coil.	6.) Show transparency or refer to fig. 5, part 9-1 , p. 04, 1969 Ford truck shop manual, Volume two.	
(1) Reading greater than specified.		
(a) Check battery and cables for loose connections or corrosion.		2.) Refer to pages in text as directed by the instructor.
(b) Check primary wiring for insulation, broken strands, and loose or corroded terminals.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(c) Check resistance for damage and the relay to ignition switch for malfunctions. (2) Reading lower than specified. (a) Replace resistance wire. b. Test ignition starting switch. (1) Reading greater than specified. (a) Tighten terminals or replace the wiring. c. Test resistance wire . (1) Reading greater or less than specified. (a) Replace the resistance wire. d. Test coil to ground. (1) Voltmeter reading greater than specified. (a) Test movable breaker point and breaker plate. (b) Test breaker plate and the distributor housing. (c) Test distributor housing and engine ground.	7.) Show transparencies or refer to fig. 6, ignition switch test, Part 9-1 , p.-04, fig. 7, Resistance test. and fig. 8, Coil to Ground Test, Part 9-1, p.-05, 1969 Ford Truck Shop Manual, Volume Two	3.) Refer to pages in text as directed by the instructor.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
e. Check and test breaker points.		
(1) Replace the breaker point assembly if the contacts are badly burned or excessive metal transfer between the points is evident.		
(a) Metal transfer is excessive when it equals or exceeds the gap setting.		
(2) Test point resestance.	8.) Refer to fig. 12, p-12, Simpson model PAT handbook.	
(a) Reading should be within the recommended specification.		
(3) Test dwell.		
(a) Dwell angle below specified amount.		
1. Point gap too large.		
(b) Dwell angle above specified amount.		
1. Point gap too small.		
(c) Adjust as required.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
f. Condenser.	9.) Refer to par.3-36 Condenser Test, pp.-20-21, Simpson Model PAT Handbook.	
(1) Inspect for cracked, broken or damaged lead.		
(2) Using condenser-magneto analyzer.		
(a) Test condenser resistance, leakage and capacity.		
1. Compare to specifications.		
2. Ignition secondary circuit test.		
Note: Breakdown or energy loss in the secondary circuit can be caused by: Fouled or improperly adjusted spark plugs, defective high tension wiring or high tension leakage across the coil, distributor cap or rotor resulting from an accumulation of dirt.		
a. Ignition coil.	10.) Refer to fig. 17 and 18, coil secondary resistance and insulation tests, pp -17-19. Simpson Model PAT Handbook.	
(1) Visually check for cracks or any other damaged.		
(2) Using condenser-magneto analyzer.		
(a) Test coil secondary resistance.		
1. Compare to specifications.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
2. Unless otherwise specified, meters should be in the green band of the coil resistance test scale, not to exceed 20,000 OHMS.		
(b) Test coil insulation .		
1. Compare to specifications.		
(3) Replace the coil if it does not meet test specifications.		
b. Distributor cap and rotor.		
(1) Clean with soft bristle brush and mild cleaning solvent or mineral spirit.		
(2) Dry with compressed air.		
(a) Observe safety practice.		
(3) Inspect the cap for cracks, burned contacts, carbon tracks, dirt or corrosion in the sockets.		
(a) Replace if damaged.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(4) Inspect rotor for cracks, loose contact strip or evidence of burning or arcing. (a) Replace if damaged. c. HIGH TENSION WIRES: (1) Test resistance of each wire. (a) Should not exceed 1000 OHMS. per. inch. (b) Do not puncture the wires with a probe. 1. Probe may cause a seperation in the conductor. d. Spark plugs test. (1) Inspect the firing end. (a) Note type of deposits and degree of electrode erosion . (2) Clean the plugs on a sand blast cleaner. (a) Follow manufacturers instructions. (3) Inspect carefully for cracked or broken insulators,badly pitted eledtrodes and other signs of malfunction.		

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(4) Replace as required.		
3. Distributor check (in-vehicle)	11. Demonstrate distributor shaft end play check using dial indicator.	4. Perform distrib shaft end play che as directed by the instructor.
a. Distributor shaft.		
(1) End play.		
(a) Use dial indicator.		
(b) Within specifications.		
b. Breaker cam.		
(1) Lubrication.		
(2) Freeness of operation.		
(3) Excessive wear.		
c. Wiring and contact points.		
(1) Broken or bare wires.		
(2) Dirty or pitted contacts.		
(3) Points alignment.		
d. Vacuum advance unit.		
(1) Freeness, alignment and wear.		
(2) Leaking diaphragm.		
(3) Broken spring.		

OUTLINE OF INSTRUCTION

INSTRUCTOR ACTIVITY

STUDENT ACTIVITY

(a) Turn the movable plate-spring should return it to it's original position when released.

e. Centrifugal advance unit.

(1) Weak springs and sticking advance weights.

(a) Turn breaker cam in the direction of it's normal rotation.

1. Should rotate freely.

2. Springs should return breaker cam to it's original position when released.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
4. Distributor test.		
Note: Should on the vehicle tests of the distributor indicate malfunction of either the mechanical or vacuum advance mechanisms, the distributor should be removed from the vehicle for complete detailed tests utilizing a Sun Distributor Tester and then serviced as required before installation.		
a. Remove distributor from vehicle and install in the distributor tester.	12. Demonstrate distributor test using distributor testor.	5. Take notes.
Note: Refer to distributor tester instruction manual for proper testing procedures.		
b. Centrifugal spark advance test.		
(1) At each specified speed, note the amount of advance.		
(a) Should be $\pm 1^{o}$ of specified figure if no range is given.		
(b) Compare with specifications.		
c. Vacuum spark advance test.		
(1) At each specified check point, note the amount of advance.		
(a) Compare with specifications.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
III. APPLICATION: A. Student will test, diagnose, repair and adjust ignition system components using tools and test equipment provided and, following manufacturer's specifications and recommendations. All performance will conform to the procedures designated by the instructor as outlined in 1969 Ford Shop Manual, Volume Two, Part 9-1 , primary and secondary circuit test and adjustments, and distributor centrifugal and vacuum advance tests and adjsutments without deviation.	13.) Direct, supervise and evaluate student performance in testing, diagnosing trouble, repairing, and adjusting ignition system components, while following manufacturer's specifications without deviation.	6.) Test, diagnose repair and adjust ignition system components as directed by the instructor while following manufacturer's specifications without deviation.
IV. SUMMARY: A. Test, diagnose troubles, repair and adjust. 1. Primary circuit. 2. Secondary circuit. 3. Distributor check (in-vehicle) 4. Distributor test off-vehicle. a. Centrifugal spark advance. b. Vacuum spark advance.	14.) Establish the instructor check points in the appropriate manuals prior to the student performance test.	

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OUTLINE OF INSTRUCTION

INSTRUCTOR ACTIVITY

STUDENT ACTIVITY

V. Test:

A. Criterion test.

VI. Assignment :

A. None.

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SCBT 332.2 CM IG 1.2.3

COURSE TITLE: GASOLINE ENGINE TUNE-UP (Advanced)

Classification: Unclassified

Topic: 1.2.3 Positive Crankcase Ventilation Service and Final Tune-Up
Average Time: Class: 4 Periods Shop: 10 Periods

Instructional Materials:

A. Text

1. Automotive Mechanics, Sixth Edition, Mc Graw-Hill Book Co.

2. 1969 Ford Truck Shop Manual, Volume Two, portion of Part 8-1, 9-1, 10-1 and 10-3

3. Universal Engine Analyzer, Simpson AFC-Pat Handbook

4. Sun Motor Tester, Model 800, Instruction Manual, (portion of entire manual).

B. Training Aids - None

C. Instructor Prepared Material

1. Transparencies

a. Dwell angle test connection

b. Ignition timing test connection

Terminal Objective: 1.2
Enabling Objective: Upon completion of this topic the student will be able to service positive crankcase ventilation system and perform final tune-up adjustments using appropriate handtools and test equipment.

Specifically, he will service positive crankcase ventilation system, adjust carburetor idle mixture, idle speed, fast idle speed (cold engine) and anti-stall dashpot; check and adjust dwell angle and ignition timing. All performance will conform to manufacturer's specifications without deviation as outlined in 1969 For Truck Manual, Volume Two, Part 8-1, Positive Crankcase Ventilation Test, pp-08-01-07 to 08-01-08, Part 9-1, Dwell Angle Check and Adjustment, Page 09-01-06, Ignition Timing Check, pp. 09-01-11 to 09-01-12, and Part 10-1, Carburetor Idle Mixture, Idle Speed, Fast Idle Speed and Anti-Stall Dashpot.Adjustments, pp. 10-01-08 thru 10-01-11.
Criterion Test: Using appropriate tools and testing equipment provided, and following manufacturer's specifications and recommendations, the student will service positive crankcase ventilation service and perform final tune-up adjustments. All performance will conform to the procedures designated by the instructor as outlined in 1969 Ford Truck Manual, Volume Two, Part 8-1 Positive Crankcase Ventilation Test, pp-08-01-07

D. Equipment

1. Major

   a. Ford 240 CID Six Cylinder Gasoline Engines

2. Test equipment

   a. Universal engine analyzer, Simpson Model AFC-Pat

   b. Positive crankcase ventilation tester C8AZ-6B627-A

3. Tools

   a. Automotive handtools

   b. Special tools

   c. Shop equipment

4. Materials (consumables)

   a. Cleaning solvent

   b. Lubricants

   c. Wiping rags

Criterion Test: (Cont.)
to 08-01-08, Part 9-1, Dwell Angle Check and Adjustment, pp-09-01-06, Ignition Timing Check, pp-09-01-11 to 09-01-12, and Part 10-1, Carburetor Idle Mixture, Idle Speed, Fast Idle Speed and Anti-Stall Dashpot Adjustments, pp-10-01-08 thru 10-01-11, without deviation.
Homework: Read:
1969 Ford Truck Shop Manual, Volume Two, Part 8-1, PCV System Service, pp-08-01-07 to 08-01-08, Part 9-1, Dwell and Ignition Timing Adjustments, pp. 09-01-12, and Carburetor Adjustments, pp-10-01-08 thru 10-01-11.

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OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
I. Introduction to the Lesson	1. Introduce self and topic.	
A. Establish contact.		
1. Name:		
2. Topic: 1.2.3 Positive Crankcase Ventilation Service and Final Tune-Up		
B. Establish readiness	2. Motivate student.	
1. Purpose		
2. Assignment		
C. Establish effect	3. Bring out need and value of material being presented.	
1. Valve		
a. Pass course.		
b. Perform better on the job.		
c. Get advanced.		
d. Be a better construction mechanic.		
D. Overview:	4. State learning objectives.	
	a. State information and materials necessary to guide student.	

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
II. Presentation		
A. Servicing positive crankcase ventilation system		
NOTE: A malfunctioning positive crankcase ventilation system may be indicated by loping or rough engine idle. Do not attempt to compensate for this idle condition by disconnecting the PCV system and/or making carburetor adjustments. PCV system tests should be performed to determine whether the loping or rough idle condition is caused by a malfunctioning crankcase ventilation system.		
1. Air intake test	5. Refer to Part 8-1, pp. 08-01-07 to 08-01-08, PCV System Test 1969 Ford Truck Shop Manual; demonstrate the actual test.	1. Refer to pages in text as directed by instructor.
a. Use tester C8AZ-6B267-A		
b. Engine at normal operating temperature and recommended idle speed.		
c. Clean or replace malfunctioning components as required.		
d. Repeat the test after repairs are made.		
2. Regulator valve test		
a. Install a known good regulator valve.		
b. Compare the engine idle condition to the prior idle condition.		
(1) Idle condition remains loping or rough with good regulator valve installed.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
(a) Check PCV system for restriction at the intake manifold or carburetor spacer.		
(b) Clean hoses and fittings.		
B. Adjust ignition system		
1. Check/adjust dwell angle.	6. Refer to Part 9-1, Page 09-01-06, Dwell Check and Adjustment, 1969 Ford Truck Shop Manual, Volume Two.	
a. Use tach-dwell-ignition tester.		
b. Compare reading to specifications.		
(1) Dwell angle below specified amount.		2. Participate in classroom discussion and take notes.
(a) Point gap too large.		
(2) Dwell angle above specified amount.		
(a) Point gap too small.		
(3) Adjust as required.		
2. Check/adjust ignition timing.		
a. Use tachometer advance tester.	7. Refer to 1969 Ford Truck Shop Manual, Volume Two, pp-09-01-11 to 09-01-12, Fig. 19, 20, and 21; and Simpson Model Pat Handbook, Fig. 15 and 16, and pp. 15, to 17.	
b. Disconnect and plug vacuum line/s.		
c. Adjust engine speed to that specified for ignition timing.		
d. Compare readings to specifications - adjust as required.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
C. Adjust fuel system		
1. Adjust idle speed and fuel mixture.	8. Demonstrate the actual dwell angle and ignition timing tests.	4. Refer to page in text as directed by instructor.
NOTE: To help assure that vehicles operate within the limits of government regulations governing exhaust emission, most carburetors are equipped with idle fuel mixture adjusting limiters. The limiters control the maximum idle fuel richness and help prevent unauthorized persons for making overly rich idle adjustments.	9. Refer to Part 10-1, Carburetor Adjustments, 1969 Ford Truck Shop Manual, Volume Two.	
a. Normal idle fuel settings - engine off.		
(1) Set the idle fuel mixture screw/s and limited cap/s.		
(a) To full counter-clockwise position of the limiter cap/s.		
(2) Back off the idle speed adjusting screw.		
(a) Throttle plate/s seat in the throttle bore/s.		
1 May be necessary to loosen the dashpot.		
(3) Establish a preliminary idle speed adjustment.		
(a) Turn the idle speed adjusting screw inward until it makes contact with the stop screw.		
1 Then turn the screw inward 1-1/2 turns.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
b. Normal idle fuel settings - engine on.		
(1) Set parking brake.		
(2) Normalize the engine and under-hood temperatures.		
(3) Use an accurate reading tachometer.		
(4) Choke plate to full-open position.		
(5) Final idle speed adjustment.		
(a) Air conditioner turned on.		
(6) Adjust the engine curb idle RPM to specifications.		
(7) Idle mixture adjustment.		
(a) Smoothest idle possible within the range of the idle limiter/s.		
(8) Check idle smoothness.		
(a) With air cleaner installed.		
(9) Adjust fuel bowl vent valve (if so equipped) to specifications.		
NOTE: Refer to additional idle speed and fuel mixture procedures if a satisfactory idle condition is not achieved by performing the normal procedures.		
2. Fast (cold engine) idle speed adjustment	10. Refer to Part 10-1, pp. 10-01-10 to 10-01-11 1969 Ford Truck Shop Manual, Volume Two.	5. Refer to pages in text as directed by the instructor.
NOTE: The idle (hot engine) speed and mixture is adjusted to specification before attempting to set fast idle speed.		

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
a. Varies according to the makes and models. (1) Adjusted with the engine running. (a) Turn fast idle adjusting screw as required to obtain the specified RPM. (2) Adjust fast idle by bending the choke connecton rod. (a) Until there is a light contact between the fast idle arm and the stop on the carburetor body.		
3. Anti-stall dashpot adjustment NOTE: Engine idle speed and mixture must be adjusted before adjusting anti-stall dashpot. a. Air cleaner removed. b. Choke plate open. c. Throttle plate closed (idle position). d. Check the clearance between the throttle lever and dashpot plunger tip. (1) Use feeler gauge. (2) Adjust as required.		6. Take notes.
III. Application A. Student will service PCV System, check and adjust dwell angle and ignition timing, and adjust carburetor idle mixture/speed, fast idle (cold engine) and anti-stall dashpot, using appropriate tools and testing equipment provided and following manufacturer's specifications and	11. Establish instructor check points in the appropriate manual/s prior to the student performance test.	7. Service PCV System and perform final tune-up adjustment as directed by the instructor while complying with manufacturer's specifications without deviation.

OUTLINE OF INSTRUCTION	INSTRUCTOR ACTIVITY	STUDENT ACTIVITY
recommendations. All performance will conform to the procedures designated by the instructor as outlined in 1969 Ford Truck Shop Manual, Volume Two covering the above-mentioned tests without deviation.	12. Direct, supervise and evaluate student performance in servicing PCV System, check and adjust dwell angle and ignition timing, and adjust carburetor idle mixture/speed, fast idle (cold engine) and anti-stall dash pot. While complying with manufacturer's specifications without deviation.	
IV. Summary		
A. Servicing Positive Crankcase Ventilation System		
B. Adjust Ignition System		
C. Adjust Fuel System		
V. Test		
A. Criterion test		
VI. Assignment		
A. None		